

**LBNL SAFETY REVIEW COMMITTEE**

**Triennial Review of the  
Management of Environment, Safety, and Health**

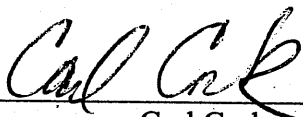
**Advanced Light Source Division**

**July 2006**



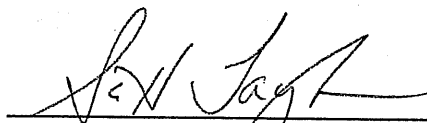
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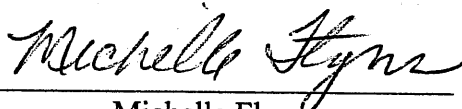
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# **Triennial Review of the Advanced Light Source Division Management of Environment, Safety, and Health (MESH)**

**July, 2006**

## **A. Executive Summary**

The Advanced Light Source (ALS) Division strives to manage environment, health, and safety effectively and proactively, and has a comprehensive safety program. The Quality and ES&H Team (QUEST) Committee meets monthly; its members include the leaders of all the individual safety circles. QUEST teams, which include all division staff, even those who are matrixed, are integral to the ALS safety program, serving as the main safety communication conduit in the Division. Monthly team meetings provide members an opportunity to hear Division QUEST Committee activities, and provide feedback that team leaders share at the divisional level. QUEST teams also perform self-assessment inspections of all staff workspace. The newly formed Staff Safety Committee represents a broad spectrum of the ALS community, and will be responsible for investigating adverse environment, safety and health (ES&H) incidents at the ALS. The ALS also has Technical Safety Committees, the memberships of which vary depending upon the nature of the system under review. Meeting as needed (generally three to six times per year), a Technical Safety Committee reviews all designs and modifications of personnel protection systems. Finally, a Beamline Review Committee performs a conceptual review, design review, and readiness review before a beamline is approved for operation. The main concerns of the Beamline Review Committee are user safety and beamline compatibility and operation.

Since its last MESH Review in 2003, the number of ALS beamlines has grown from 30 to 37, with a corresponding increase in user population. Over the same period, ALS experienced significant reductions in operating funds and staff, which contributed to degradation in line management of ES&H. Following several shielding control procedure violations in 2005 (none of which resulted in personnel radiation exposure or injury) the Radiation Safety Committee (RSC) commissioned a subcommittee investigation to assess the effectiveness of shielding control procedures, engineering controls, training, EH&S Division staff support and management oversight. Root causes of the three incidents included, among others, failures in line management accountability, supervision, and staffing. The subcommittee made recommendations in four key areas: management, ALS ES&H and EH&S Division issues, administrative and engineering controls, and training and procedures. The ALS accepted all of the subcommittee recommendations and addressed them according to an agreed upon schedule for completion.

This MESH Review notes five noteworthy practices, seven observations, and six concerns. The ALS faces significant challenges in implementation of its new safety line-management structure. The Division made recent organizational changes to improve feedback and improvement, an area in need of attention. A crowded work environment and managing over 400 procedures remain concerns. ALS's new user facility, planned for construction in 2007, should substantially alleviate crowding.

## **B. Description of Division**

The Advanced Light Source (ALS) is a national user facility that generates intense light for scientific and technological research. The ALS is one of the world's brightest sources of ultraviolet and soft x-ray beams and the world's first third-generation synchrotron light source in its energy range. The facility hosts researchers from universities, industries, and government laboratories around the world.

The ALS is composed of 250 staff including 125 matrixed individuals from other divisions. Approximately 2,400 visitors used the facility in the past year. Division workspace includes buildings 2, 4, 6, 7, 10, 27, 46, 80, and 80A. The synchrotron, housed in building 6, can accommodate thirty-nine different research groups simultaneously. At the time of the MESH review, the ALS Division was undergoing a comprehensive reorganization. The planned organization consists of six groups: User Services, Scientific Support, Experimental Systems, Environment Safety and Health (ES&H), Operations and Accelerator Development, and Planning and Administration.

The most significant hazards that ALS staff confront are laser, radiation, and electrical. High and medium hazards are controlled by formal authorizations. The Division has nine activity hazard documents (AHDs) related to compressed gases, high-pressure systems, and lasers. ALS also has three radiological work authorizations (RWAs), two radiological work permits (RWPs), and two X-Ray use authorizations. The Division manages seven Satellite Accumulation Areas (SAAs), and has no Radioactive or Mixed Waste SAAs or Waste Accumulation Areas.

## **C. Introduction: Description of the Appraisal Process**

The objective of the MESH Review is to evaluate the Advanced Light Source Division's management of ES&H in its operations and research, focusing on the implementation and effectiveness of the Division's Integrated Safety Management (ISM) Plan. It is a peer review that provides a strong perspective from the research and operations community on the state of ES&H in the Division.

The appraisal process included a review of the documentation provided by ALS Division and the Office of Contract Assurance, including responses to the MESH questionnaire; an opening meeting with Division representatives; and a walkthrough of Division workspaces. The MESH review team consisted of Peter Seidl, team leader from Accelerator and Fusion Research Division; Carl Cork, Physical Biosciences Division; Scott Taylor, Life Sciences Division; and Michelle Flynn, Office of Contract Assurance.

The documentation review concentrated on ALS's response to the MESH questionnaire and supporting documentation provided. Documentation provided included the Division ISM Plan, lists of formal authorizations and procedures, Corrective Action Tracking (CATS) records, agendas and minutes from safety meetings, example Experiment Summary Sheets (ESSs), recommendations from an RSC investigative subcommittee report (Attachment A), and ALS presentations in response to those recommendations.

The MESH team held an opening meeting with Ben Feinberg (Deputy Division Director and chair of the Division ES&H / QA Committee), and Jim Floyd (interim ES&H Manager). Ben and Jim described the functions of the Division safety committees, experiment review process, staff training, and workspace inspections. They also addressed MESH Team questions regarding guests, matrixed staff, nighttime operations, and equipment safety standards. The MESH Team also interviewed the following individuals:

- Rick Bloemhard, Accelerator Operations Lead, ALS
- Warren Byrne, Accelerator Operations Deputy, ALS
- Donna Hamamoto, Beamline Coordinator, ALS
- John Pruyn, Beamline Coordinator, ALS

The MESH team inspected the ALS facility and staff workspaces in building 10. During the walkthrough, the MESH team conducted interviews for the purpose of assessing staff ES&H perception and responsibilities. The following individuals were interviewed:

- Corie Ralston, Beamline Scientist, Physical Biosciences Division
- Jonathan Denlinger, Beamline Scientist, Advanced Light Source
- Simon Clark, Beamline Scientist, Advanced Light Source

#### **D. Results of the MESH Appraisal**

The SRC MESH team met with ALS division representatives Ben Feinberg and Jim Floyd on July 18, 2006. There were subsequent walk-around inspections and interviews with various ALS personnel on July 18 and July 20. The MESH team conducted a follow-up meeting with Ben Feinberg and Jim Floyd on September 15, 2006. The appraisal results are organized by areas of inquiry from the MESH questionnaire, which follows the core functions of Integrated Safety Management. Findings are broken into three categories:

Noteworthy practices – practices or conditions that are recognized for their excellence and should be considered for Lab-wide application.

Observations – observations indicate room for improvement. They may be practices or conditions that are not necessarily out of compliance, but could lead to non-compliance if unaddressed. Observations may also reflect practices that, with some additional level of effort, could achieve noteworthy practice status.

Concerns – clear cases of practices or conditions that do not comply with regulations or LBNL policy, and/or indicate inadequate management systems within the division. Concerns are deficiencies and must be corrected.

#### **1. Work Planning**

ALS effectively plans work. The Division ES&H/ QA Committee and QUEST Teams ensure safety is integrated into work planning through continual safety communication. Division and program managers, group leaders, and principal investigators are responsible for considering

ES&H concerns during the work planning process. Field Task Proposals / Agreements, Work for Others Requests, Cooperative Research and Development Agreements, and Lab Directed Research and Development documents are reviewed for ES&H compliance.

**Noteworthy Practice:** ALS's safety website and QUEST process are effective and proactive. The ALS interim ES&H manager has initiated coordination meetings with the Beamline Scientist line managers in order to assist them with their new added safety responsibilities. The safety website and QUEST process should be augmented to further support the line managers.

**Noteworthy Practice:** The ALS reorganization is a positive start toward implementing a line-management based structure. In particular, reorganization and redefinition of the ES&H group is a positive move. Moving Beamline Coordinators into Operations should help balance and clarify accelerator versus beamline roles, and assigning Beamline Scientists as the focus for user safety is likely to be a successful mechanism for assuring comprehensive user safety while at the facility. However, the MESH Team also identified two observations and two concerns related to the reorganization, as described below.

**Observation:** The reorganization calls for reintegration of the Beamline Coordinators Group into Operations. The ALS is also splitting the group into Floor Operators and User Floor Services Coordination (under separate groups). The ALS management and staff did not appear to have a clear picture of the roles and responsibilities for these two subgroups. They did indicate that this was a work in progress. There is a risk of excessive overlap in responsibilities and of spreading an already thin staff even thinner. Key staff members in both beamline coordination and operations are routinely called in when off shift.

**Observation:** Non-ALS Beamline Scientists are not supervised at a level that effectively implements ISM and line-management responsibility. The Memoranda of Understanding (MOUs) for managing the safety of non-ALS programs are not well defined. The ALS did not provide examples for how they guarantee compliance and interoperability with ALS operations. MOUs should be updated following guidance from the Regulations and Procedures Manual Section 7.01.

**Concern:** It was unclear to the MESH Team how ALS will adequately support Beamline Scientists in their increased safety responsibilities, particularly those responsible for non-ALS beamlines. Floor Operators and User Services will support Beamline Scientists, though ALS management indicated this was a work-in-progress and they did not have well-developed proposals at the time of the interviews. The MESH Team is not convinced that the proposed number of ALS staff persons will be sufficient to adequately support the Beamline Scientists. In addition, there are indications that not all beamline supervisors have "bought in" to this increase in safety management responsibilities. Key staff reported that not all Beamline Scientists respect the work planning process, and gave an illustrative example of a Beamline Scientist circumventing Lab policy regarding use of biological materials. Line management responsibilities regarding supervision of Beamline Scientists need to be better established, especially for non-ALS supervised beamlines.

**Concern:** ALS ES&H vs. EH&S Division roles are not clearly defined. The RSC subcommittee recommendation #7 (Attachment A) clearly suggested that ALS ES&H should focus on support for fabrication and operations for user systems, while the EH&S Division should focus on

oversight and compliance. To date, ALS management has not indicated their final response to this recommendation. This is still a work-in-progress, but is of concern because it is essential that there be clear lines of safety responsibility as well as immediate, convenient, support for operations activities.

## **2. Hazard Identification and Risk Analysis**

To conduct research at the ALS, lead researchers must submit an *ALS Experiment Form* describing the experiment and all potential hazardous materials and equipment to be used at the ALS. The research team is offered the *ALS Hazard Guide Assessment Table* and support from ES&H professionals to successfully complete this submission. This information is used by the ES&H technical and professional review team to generate an *Experiment Summary Sheet* (ESS). The ESS is the work authorization and specifies the controls, operating conditions, and training needed to conduct the research within the authorized parameters. The signatories on the ESS (Experiment Certification page) include the technical and professional reviewers, the ALS ES&H Coordinator, the Beamline Scientist, and the Experimenter in Charge. A current, signed ESS must be posted in the workplace. Formal Authorizations needed from the EH&S Division are triggered by this process and become part of the ESS. Work not requiring formal EH&S Division authorization is authorized by identification of hazards in the HEAR database, which is reviewed and updated annually.

As required by Pub 3000 Chapter 6, designated project participants complete AHDs that address experimental activities and modifications to experiments that add new hazards or increase the level of hazards. Current AHDs forms are on file in the ALS safety office, and posted at the work area for all projects requiring AHDs.

The ALS Division Safety Coordinator walks through all ALS workspaces quarterly. The tracking of the findings from these walkthroughs are entered into the Corrective Actions Tracking System (CATS) and managed from there. Additionally, scheduled staff walkthroughs with an electrical safety expert are conducted twice per week, and on-site staff provides daily informal walkthroughs of space.

New and modified beamlines at the ALS are reviewed and authorized by the Beamline Review Committee in accordance with an approved procedure.

**Observation:** The ALS procedure system is very comprehensive, but it is huge. A reduction in the number of procedures either by combining some of them so that they have greater breadth, or by replacing them with improved engineering controls would be beneficial. This is a repeat of an observation identified in the June 2003 MESH, which noted that some procedures were beyond their review period and suggested eliminating less critical procedures or lengthening the review period. Furthermore, the RSC subcommittee recommended a critical review of shielding configuration control procedures for consistency and accuracy.

### 3. Establishment of Controls

ALS establishes administrative controls through both formal authorization and self-authorization procedures. Formal authorization is done in accordance with established laboratory requirements and procedures. Self-authorized work is controlled through Work Permits and the ESS system. Compliance is ensured through daily walkthroughs by Beamline Coordinators and the RCT, quarterly walkthroughs by the ALS ES&H Coordinator, and annual QUEST team inspections.

**Observation:** Better use should be made of the ALS introductory training video to address concerns common to all users. In particular, cryogenics, beam line access and status, work stoppage, etc. should be addressed in greater detail.

**Concern:** There is a significant increase in Class-IIIB and Class-IV lasers on the ALS floor; almost all of the new beamlines since the last MESH review have incorporated lasers with their operation. Equipment setup and configuration is often in progress at any time somewhere on the ALS floor, and the safety risk is much higher during these times. The MESH Team questioned the status of one observed laser operation, and only the EH&S Laser Safety Officer, who happened to be on the floor, could determine if the laser was on or off. Furthermore, the RSC subcommittee recommended a complete review of all ALS laser systems and practices, based on information obtained while investigating shielding control.

**Concern:** There is not an adequate system for indicating to users, maintenance personnel and visitors that a specific portion of the beamline is on-line. This observation is consistent with an identified root cause from the RSC subcommittee investigation that beamline status displays need improvement.

**Concern:** Hazards vary from beamline to beamline. Workers at adjacent beamlines have no easy way of quickly determining what hazards are present a few feet away. Some method of identifying hazards at the entrance to each beamline should be considered. Standardized identification of all hazards, authorized users, and emergency contacts for each beamline, similar to the signs on laboratory doors, would improve safety communication. The MESH Team did not find controls to ensure those with access to beamlines have the required training, nor were they even aware of the hazards present.

### 4. Work Performance

Each supervisor is responsible for ensuring that all employees assigned to the ALS for an anticipated period of greater than three months complete the job hazard questionnaire (JHQ) and required training. This is a successful practice, as Division staff has completed JHQs and required training at a very high rate. Additionally, all users receive task-specific individual training.

Following three shielding control procedure violations, ALS received a Level III RWA non-compliance citation and a “stop-work” notification to suspend removal of any accelerator or beamline shielding, pending a review and further directions from the RSC. The Laboratory submitted a Non-compliance Tracking System report in accordance with the Price-Anderson

Amendments Act for the three shielding control procedure violations. In accordance with Occurrence Reporting Processing System (ORPS) protocol, the ALS also submitted an ORPS report entitled *Recurring Deficiencies in ALS Implementation of LBNL Radiation Protection Program*, which summarized previously identified weaknesses in ALS radiation shielding control, lapses in control of radiological materials and authorizations for radiological work at the ALS, and concerns about ALS worker access and training deficiencies. Lastly, ALS suffered one OSHA recordable injury during the last self-assessment reporting period (July 1, 2005 – June 30, 2006).

ALS has, and continues to, expend tremendous time and effort to address and prevent recurrence of adverse ES&H incidents.

**Noteworthy Practice:** Common among those interviewed was their confidence in “stop work” authority. One Beamline Coordinator described an example where she keyed-off a beamline when proper work authorizations were incomplete. Furthermore, she did not enable the beamline even when asked by her supervisor if an exception were possible. A Beamline Scientist in the Physical Biosciences Division feels supported by her management, and stated that if a user is not complying with policy and procedures they will be threatened with suspension and/or revocation of beamline use.

**Noteworthy Practice:** The pro-active approach taken for top-off mode is commendable. The ALS has confronted the potential radiation safety issues head-on by engaging the Berkeley Site Office and other interested parties at an early stage. Based on simulations and testing to date, it appears likely that the radiation dose rate on the ALS floor will be lower with the two-fold higher average intensity in top-off mode.

**Observation:** The MESH team visited one of the BCSB/PBD beamlines (8.2.1) and spoke with the Beamline Scientist (Corie Ralston). From a safety standpoint, the team felt that this was a very well run beamline and could serve as an example for other beamlines at the ALS. User communications are excellent, safety equipment is well stocked and clearly visible, and a safety culture was prominently advocated.

**Observation:** Insufficient space remains an issue, as identified in the 2003 MESH. Construction of the new User Support Building, planned for 2007, should alleviate some overcrowding. Of particular concern is overcrowding of unrelated groups. In addition to standardized identification of hazards described in Establishment of Controls above, familiarization of users with their neighbors’ beamlines would better prepare occupants of the facility in the event of an emergency. For example, many beamline scientists are untrained in laser operations and could not respond to emergencies in adjacent beamlines. A specific example noted during this MESH was overcrowding of the X-ray lab in B6-2215. This lab had two machines in close proximity. One machine appeared to be in a relatively stable operating state, but the adjacent experiment was under significant development. Each machine was being operated by a different group. The individual groups were not familiar with the work being done by the other group. ALS management needs to implement procedures to guarantee safety in this and similar shared spaces.



## 5. Feedback and Improvement

Senior and line management is directly involved in the division self-assessment program as members of QUEST teams. In this way, management participates in workspace inspections and safety communications with staff. The ALS Division Safety Coordinator walks through all ALS workspaces quarterly and workspace safety deficiencies are tracked in CATS.

QUEST membership consists of the leaders of all of the individual safety circles. These safety circles meet monthly to pass along information they receive at ALS ES&H Committee meetings. These safety circles encompass the entire ALS staff including those who are matrixed.

**Noteworthy Practice:** Establishment of the Staff Safety Committee (SSC) representing a broad spectrum of the ALS community, and its charge to investigate future adverse incidents is noteworthy.

**Observation:** ALS is inconsistently addressing workspace safety deficiencies in a timely manner, as evidenced by a poor completion rate for the self-assessment performance year.

**Concern:** Management inconsistently addresses concerns and recommendations made by staff. As noted by the RSC subcommittee, a Process Improvement Team (PIT) formed in 1999 made recommendations regarding a Facility Coordinator position and the work permit process. Another PIT formed in 2004 made similar recommendations, at which time the ALS appointed a Facility Coordinator, though did not implement a robust work permit process. The RSC subcommittee determined these recommendations were not addressed satisfactorily by management, leaving many ALS staff members with an impression of unresponsiveness by management. Only recently has the ALS acted on these recommendations by hiring a new Facility Coordinator. Another example involves inadequate enforcement of safety procedures. The January 2006 Safety Committee meeting minutes include comments from an employee who stopped several people from dispensing liquid nitrogen without proper protective equipment (PPE). The MESH team also observed someone dispensing liquid nitrogen without the use of proper PPE during the ALS site visit. One Beamline Scientist interviewed considers the handling of this material without the proper controls as one of the greatest hazards to staff.

## **Attachment A**

- RSC Subcommittee Report to Investigate and Review ALS Shielding Control Procedures, Section VIII Recommendations (report follows this page)